IN THE CLAIMS

Please amend claims 2, 10, 17 and 18 as follows:

1. (PREVIOUSLY PRESENTED) A method of simplifying a query in a computer to retrieve data from a database, comprising:

(a) determining whether a query includes a self join that is transitively derived through table expressions having UNION operators; and

(b) simplifying the query to eliminate the table expressions and to reduce the query to an equivalent query over tables, when the query includes the self join that is transitively derived through the table expressions having the UNION operators.

2. (CURRENTLY AMENDED) The method of claim 1, wherein the determining step (a) and simplifying step (b) are performed for each quantifier in the query, in order to determine whether the quantifier is part of [[a]] the self-join that ~~can be eliminated~~ is transitively derived through table expressions having UNION operators.

3. (PREVIOUSLY PRESENTED) The method of claim 2, wherein the simplifying step (b) comprises:

rewriting the table expressions such that quantified columns to be eliminated are substituted by other quantified columns in a same equivalence class; and

once all quantified columns have been rewritten, removing the quantifier from the query.

4. (ORIGINAL) The method of claim 3, wherein the equivalence class is determined by the presence of join predicates establishing equality among quantified columns.

5. (ORIGINAL) The method of claim 3, wherein the quantifier is only considered for elimination when it is represented in each equivalence class.

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6. (ORIGINAL) The method of claim 1, wherein the determining step (a) and simplifying step (b) are implemented as a rule-based transformation, the determining step (a) comprises a condition part of the rule, and the simplifying step (b) comprises an action part of the rule that is performed when the condition part is true.

7. (ORIGINAL) The method of claim 6, wherein the condition part of the rule requires:

(1) that a quantifier Q_i in the query is a FOR EACH quantifier;

(2) that Q_i is defined within a SELECT operator that implements an inner join;

(3) that there are at least two quantifiers Q_i and Q_j in the SELECT operator;

(4) computing equivalence classes among columns in the SELECT operator, wherein the equivalence classes are divided into three classes:

    (A) Type 1 equivalence classes are sets of quantified columns over quantifiers other than Q_i;

    (B) Type 2 equivalence classes are sets of quantified columns that reference Q_i and at least one other quantifier Q_j;

    (C) Type 3 equivalence classes are sets of quantified columns that only reference Q_i;

(5) for each set S_i of Type 2 equivalence classes, separating quantified columns according to the quantifiers over which they range;

(6) enumerating all combinations of quantified columns $KEY_1, ..., KEY_n$ over Q_i;

(7) retaining only those Q_i where KEY_i comprises key columns;

(8) computing the derivation of Superset columns from which KEY_i is derived and adding them to KEY_i;

(9) for each quantifier Q_j in the SELECT operator where $Q_j <> Q_i$, if Q_j has a quantified column in each Type 2 equivalence class:

    (A) computing the derivation of Subset columns from which Q_i is derived;

    (B) for each derivation in Q_i:

        (i) for all lists of quantified columns in the derivation:

            (I) the list of quantified columns matches at least one list of quantified columns in KEY_i.

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8. (ORIGINAL) The method of claim 6, wherein the action part of the rule requires:

(1) for each Type 2 equivalence class:

(a) replacing all occurrences of quantified columns over Qi with quantified columns in the same Type 2 equivalence class;

(2) removing Qi from the query.

9. (PREVIOUSLY PRESENTED) A computer-implemented apparatus for simplifying a query, comprising:

a computer, wherein the query is performed in the computer to retrieve data from a database;

logic, performed by the computer system, for:

(a) determining whether a query includes a self join that is transitively derived through table expressions having the UNION operators; and

(b) simplifying the query to eliminate the table expressions and to reduce the query to an equivalent query over tables, when the query includes the self join that is transitively derived through the table expressions having the UNION operators.

10. (CURRENTLY AMENDED) The apparatus of claim 9, wherein the logic for determining (a) and logic for simplifying (b) are performed for each quantifier in the query, in order to determine whether the quantifier is part of [[a]] the self-join that ~~can be eliminated~~ is transitively derived through table expressions having UNION operators.

11. (PREVIOUSLY PRESENTED) The apparatus of claim 10, wherein the logic for simplifying (b) comprises logic for:

rewriting the table expressions such that quantified columns to be eliminated are substituted by other quantified columns in a same equivalence class; and

once all quantified columns have been rewritten, removing the quantifier from the query.

12. (ORIGINAL) The apparatus of claim 11, wherein the equivalence class is determined by the presence of join predicates establishing equality among quantified columns.

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13. (ORIGINAL) The apparatus of claim 11, wherein the quantifier is only considered for elimination when it is represented in each equivalence class.

14. (ORIGINAL) The apparatus of claim 9, wherein the logic for determining (a) and logic for simplifying (b) are implemented as a rule-based transformation, the logic for determining (a) comprises a condition part of the rule, and the logic for simplifying (b) comprises an action part of the rule that is performed when the condition part is true.

15. (ORIGINAL) The apparatus of claim 14, wherein the condition part of the rule requires:

(1) that a quantifier Q_i in the query is a FOR EACH quantifier;

(2) that Q_i is defined within a SELECT operator that implements an inner join;

(3) that there are at least two quantifiers Q_i and Q_j in the SELECT operator;

(4) computing equivalence classes among columns in the SELECT operator, wherein the equivalence classes are divided into three classes:

(A) Type 1 equivalence classes are sets of quantified columns over quantifiers other than Q_i;

(B) Type 2 equivalence classes are sets of quantified columns that reference Q_i and at least one other quantifier Q_j;

(C) Type 3 equivalence classes are sets of quantified columns that only reference Q_i;

(5) for each set S_i of Type 2 equivalence classes, separating quantified columns according to the quantifiers over which they range;

(6) enumerating all combinations of quantified columns KEY_1, ..., KEY_n over Q_i;

(7) retaining only those Q_i where KEY_i comprises key columns;

(8) computing the derivation of Superset columns from which KEY_i is derived and adding them to KEY_i;

(9) for each quantifier Q_j in the SELECT operator where $Q_j <> Q_i$, if Q_j has a quantified column in each Type 2 equivalence class:

(A) computing the derivation of Subset columns from which Q_i is derived;

(B) for each derivation in Q_i:

(i) for all lists of quantified columns in the derivation:

(I) the list of quantified columns matches at least one list of quantified columns in KEY_i.

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16. (ORIGINAL) The apparatus of claim 14, wherein the action part of the rule requires:

(1) for each Type 2 equivalence class:

(a) replacing all occurrences of quantified columns over Qi with quantified columns in the same Type 2 equivalence class;

(2) removing Qi from the query.

17. (CURRENTLY AMENDED) [[An]] A device embodying logic for simplifying a query in a computer to retrieve data from a database, the logic comprising:

(a) determining whether a query includes a self join that is transitively derived through table expressions having the UNION operators; and

(b) simplifying the query to eliminate the table expressions and to reduce the query to an equivalent query over tables, when the query includes the self join that is transitively derived through the table expressions having the UNION operators.

18. (CURRENTLY AMENDED) The device of claim 17, wherein the determining step (a) and simplifying step (b) are performed for each quantifier in the query, in order to determine whether the quantifier is part of [[a]] the self-join that ean-be-eliminated is transitively derived through table expressions having UNION operators.

19. (PREVIOUSLY PRESENTED) The device of claim 18, wherein the simplifying step (b) comprises:

rewriting the table expressions such that quantified columns to be eliminated are substituted by other quantified columns in a same equivalence class; and

once all quantified columns have been rewritten, removing the quantifier from the query.

20. (PREVIOUSLY PRESENTED) The device of claim 19, wherein the equivalence class is determined by the presence of join predicates establishing equality among quantified columns.

21. (PREVIOUSLY PRESENTED) The device of claim 19, wherein the quantifier is only considered for elimination when it is represented in each equivalence class.

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22. (PREVIOUSLY PRESENTED) The device of claim 17, wherein the determining step (a) and simplifying step (b) are implemented as a rule-based transformation, the determining step (a) comprises a condition part of the rule, and the simplifying step (b) comprises an action part of the rule that is performed when the condition part is true.

23. (PREVIOUSLY PRESENTED) The device of claim 22, wherein the condition part of the rule requires:

(1) that a quantifier Qi in the query is a FOR EACH quantifier;

(2) that Qi is defined within a SELECT operator that implements an inner join;

(3) that there are at least two quantifiers Qi and Qj in the SELECT operator;

(4) computing equivalence classes among columns in the SELECT operator, wherein the equivalence classes are divided into three classes:

    (A) Type 1 equivalence classes are sets of quantified columns over quantifiers other than Qi;

    (B) Type 2 equivalence classes are sets of quantified columns that reference Qi and at least one other quantifier Qj;

    (C) Type 3 equivalence classes are sets of quantified columns that only reference Qi;

(5) for each set Si of Type 2 equivalence classes, separating quantified columns according to the quantifiers over which they range;

(6) enumerating all combinations of quantified columns KEY1, ..., KEYn over Qi;

(7) retaining only those Qi where KEYi comprises key columns;

(8) computing the derivation of Superset columns from which KEYi is derived and adding them to KEYi;

(9) for each quantifier Qj in the SELECT operator where Qj <> Qi, if Qj has a quantified column in each Type 2 equivalence class:

    (A) computing the derivation of Subset columns from which Qi is derived;

    (B) for each derivation in Qi:

        (i) for all lists of quantified columns in the derivation:

            (I) the list of quantified columns matches at least one list of quantified columns in KEYi.

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24. (PREVIOUSLY PRESENTED) The device of claim 22, wherein the action part of the rule requires:

(1) for each Type 2 equivalence class:

(a) replacing all occurrences of quantified columns over Q_i with quantified columns in the same Type 2 equivalence class;

(2) removing Q_i from the query.

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